



# United States Department of the Interior

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APR 28 1998



## Memorandum

To: Project Leader, Arapaho National Wildlife Refuge  
From: Chief, Division of Water Resources  
Subject: 1997-98 Annual Water Use Report/Management Plan

The subject report for Arapaho National Wildlife Refuge has been reviewed and approved as submitted.

The detailed ditch diversion report that attaches to the annual WMP has been amended from its original format and will be utilized in future reports.

Also, attached is a Review/Approval page for your files and for future use.

Thank you for the timely submission of this report and all the assistance in compiling water use data.

*George R. Smith*

Attachment

**ARAPAHO  
NATIONAL WILDLIFE REFUGE**

**ANNUAL WATER MANAGEMENT PLAN  
1997 WATER USE REPORTS  
1998 RECOMMENDATIONS**

Submitted: \_\_\_\_\_

  
Refuge Manager

Date: \_\_\_\_\_

5/7/98


Approved: \_\_\_\_\_

  
GARD, CO/KS/NE/UT

Date: \_\_\_\_\_

5/4/98

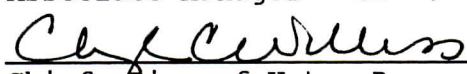
Concur: \_\_\_\_\_

  
Associate Manager - CO

Date: \_\_\_\_\_

5-1-98

Reviewed: \_\_\_\_\_

  
Chief, Div. of Water Resources

Date: \_\_\_\_\_

4-30-98

# ANNUAL WATER MANAGEMENT PLAN 1997-1998

## Arapaho National Wildlife Refuge

### I. Introduction

Arapaho National Wildlife Refuge uses four primary sources of water to provide irrigation, maintain pond levels and sustain riparian vegetation for wildlife. These four sources are the Illinois River, Spring Creek, Antelope Creek, and Potter Creek. Sixteen different headgate structures divert water out of the Illinois River into more than 70 miles of primary delivery ditches. This water supplies over 75 ponds with over 700 surface acres of water during a normal year. It is also used to flood irrigate 8,000 acres of meadow to maintain and perpetuate quality waterfowl breeding, nesting and brood rearing habitat.

In 1997, the Illinois River opened in late March, allowing headgates to be opened earlier than normal. Actual cubic feet per second is not known, as the headquarters bridge river gauge was removed in 1995 for construction purposes. The gauge has not been replaced at this time, we hope the Water Commissioner will be able to replace it in the near future. River flows were in flood stages from mid April until they peaked in late May. By the end of June, the river dropped dramatically from over approximately 200 cfs to less than 50 cfs. In late July water levels greatly increased, with substantial flows through fall. The river froze in early November.

Headgates were opened in late March (earlier than normal) and ditches were ice free by mid April. Wetland conditions for the spring were excellent with all ponds full and meadows irrigated. Most ditches were closed the end of July, but wetlands remained in good condition throughout the summer. Fall precipitation enabled us to open many headgates in September recharging wetlands before winter set in.

Precipitation in 1997 was 15.40 inches, 5.85 inches above normal, with snowfall measuring 72.9 inches in Walden. A new record was set in September for the wettest in history with 4.23 inches of precipitation. Snow pack levels in the Illinois River drainage were below average in January 1998. Unless there is heavy precipitation in February, March and April, flooding should be minimal this spring.

### II. Purpose and Methods

Spring run-off is diverted from natural water courses into delivery ditches to provide wetlands and irrigation systems with water. Approximately 8,000 acres of meadows are irrigated during an average water year to provide quality breeding, nesting and brooding habitat. Numerous ponds are also managed via diverted water each year.

Current water management practices greatly depend on winter snow packs, spring moisture and downstream water demands. However, during normal water years, the following schedule is used to provide general guidance:

April - (spring breakup) Open river headgates as snow pack allows, striving for the earliest flows possible. Drain upstream storage reservoirs (Case #1, #2, #3) on to lower units to initiate open water to attract and hold waterfowl. These reservoirs are then refilled with spring run-off water and held at optimum levels.

May - Initiate meadow irrigation as soon as ditches are ice-free and operable. Perform ditch maintenance needed. Record water flow measurements weekly. Set up a schedule for a select group of headgates to more efficiently use water from the Illinois River.

June - Maintain reservoir levels and continue irrigation and maintenance. Record water flow measurements weekly. Follow water conservation schedule on select group of headgates.

July - Consolidate water as necessary to provide brood habitat. Record water flow measurements weekly. River flows can increase during this month, as off refuge irrigation ditches are shut-down for haying.

August - Begin repairs on dikes and control structures and any new construction projects. Record water flow measurements weekly.

September - Prepare for scheduled winter fill of storage reservoirs as needed. Continue work on construction and repair projects. Record water flow measurements weekly on ditches still open.

October - Winterize water system, drain irrigation ditches, "set" water system in preparation for spring run-off. Continue construction and repair work as needed. Initiate drawdown of ponds on schedule.

November - Normal freeze-up period. Pre-snowfall 'dirt work' still possible.

December - March - Normally cold, frozen conditions prevent water management. Nesting structures can be repaired/maintained and water management structures can be built.

### III. 1997 Water Usage

Water usage is determined primarily by weekly recordings of water flows through Parshall flumes located just downstream from the various headgates or diversion structures in each irrigation ditch system. In the spring of 1997, Water Resource personnel from the RO and State Water Commission checked most of the Refuge flumes and determined that many were not reading accurately. They recommended a 'chip test' be used in order to achieve

accurate measurements. The chip test was used this year on all flumes documented to be inaccurate. We will continue to use the 'chip test' in future years on all malfunctioning flumes. In instances where measuring devices have not been installed, estimates are made relative to the known water use in other irrigation systems in 1997.

A total of 25,118 acre feet of water was diverted in 1997, similar to 1996. Limited efforts were made in the spring to manage irrigation waters more effectively by utilizing fewer acre feet from the drainage. Due to limited and inexperienced staff, success was minimal. Managing water utilization more efficiently will be a main priority in the spring of 1998.

Record high precipitation in September resulted in higher than normal river flows making total recorded acre feet diverted higher than planned. This additional water also allowed several headgates to be re-opened during the month to recharge many ponds in preparation for spring.

Several misconceptions need clarification concerning the Refuge ditches and total acre feet of water used. The total acre feet comes from adding most ditch flume readings to estimates of acre feet of several spring fed ditches (Table I). It should be noted:

The Hubbard #2 ditch originates off the Illinois River. The Hubbard #3 (Rat Ditch), Hubbard #4 and the Hubbard Caudle Extension all originate off the Hubbard #2, therefore they are not added in to the total acre feet diverted.

The Refuge shares water rights on the Midland, Everhard Baldwin and the Howard ditches and total acre feet for each of these ditches is as follows:

Midland Hackley - actual flume acre feet reading

Midland Ross - Midland flume acre feet minus the Hackley flume acre feet, divided by two, as about half of this water is the Refuges.

Howard - half of the flume acre feet reading, the Refuge has 50% of the water right.

Everhard Baldwin - The Refuge owns 47% of the total acre feet, thus the flume acre feet reading is multiplied by .47.

The Oklahoma #1 flume reading is influenced by large volumes of non-Refuge secondary water during the irrigation season. So in many cases the total acre feet reading for this ditch is much higher than what is actually diverted by the Refuge. If possible, total acre feet should be an estimated amount of the flume reading.

#### IV. Proposed 1998 Water Use

Water use in 1998 will not be substantially different from that planned for previous years. If possible all wetlands will be filled as early as possible in the spring to maximize spring run-off use. Optimum water levels will be maintained for as long as possible to encourage waterfowl mating, nesting and brood rearing.

One of the following general plans will be implemented dependent upon the availability of water in 1998:

##### Plan A - Average Water Year

1. Refuge ponds will be filled as early as possible to attract spring migrants to remain and nest. Two to three ponds will be held at 80 percent capacity to provide shoreline habitat for migrating shorebirds during May and early June.
2. Meadow areas will be irrigated by take-outs in the diversion ditches or sub-irrigated by seepage from the ditches.
3. As many ponds as possible will be maintained at optimum levels for as long as possible. If necessary some ponds may be sacrificed for more important brood ponds later in the summer.
4. Following the upstream irrigation season of hay meadows, increased flow in the Illinois River may be used to refill ponds in order to provide fall migrational habitat and reserve water for the following year.

##### Plan B - Extremely Wet Water Year

1. Marginal meadow areas not normally irrigated will be irrigated to provide additional wetland habitat for wildlife.
2. Additional water will be circulated through impoundments keeping them fresh, which will aid in the production of emergent and submergent vegetation and encourage invertebrates as sources of food and cover for wildlife.
3. Four to six ponds will be held at 80 percent capacity to provide shoreline habitat for migrating shorebirds during May and early June.
4. Water will run longer in the season keeping ponds relatively full at freeze-up. This will help ensure that at least some water will be available the following spring even in the event of a dry year.

5. Several ditches on the Soap Creek and Anderson tracts were cleaned.

The following work, not in priority order, is needed and will be accomplished as manpower and working conditions permit:

1. Install water control structures into N. & S. Hackley, Rodriguez, and Headwaters ponds.
2. Determine surface acreage and storage capacity for eleven existing ponds and all new ponds.
3. Install and or rehab Parshall flumes as needed, including Hackley, Midland Extension, Midland Anderson, Midland Ross, Hubbard #4.
4. Replace deteriorating or missing river headgates on the Hubbard #2, Hill & Crouter, Dryer, Ward #2, and Ish Baldwin ditches.
5. Continue ditch clean-outs as time and money permit (by contract if possible).
6. Measure capacity of Fish Hatchery spring (Potter Creek) to determine amount of water flowing into Potter #2 ditch.
7. Rehab North Allard Contour and Case #3 Contour dikes.

Table I

DITCH	REFUGE 1997 ACRE FEET DIVERTED
Antelope	250
Boyce Brothers	1468
Dryer	253
Everhard Baldwin	1003
Hill & Crouter	268
Home #1	2222
Howard	1320
Hubbard #1	75
Hubbard #2	7485
Hubbard #3 (Rat)*	708
Hubbard #4*	3000
Hubbard Caudle*	2557
Ish Baldwin	150
Midland (Ross)	2364
Midland (Hackley)	261
Midland (Extension)	-
North Park #6	714
Oklahoma #1	1365
Oklahoma #2	1012
Potter #2	200
Riddle Ditch	752
State Walden Pipeline	500
State Walden Res.	35
Ward #1	2844
Ward #2	504
Ward #3	73
<b>TOTAL</b>	<b>25118</b>

\* Not Included In Total

Table II

POND	DATE	PRESCRIPTION	STATUS
Rat Ditch	October 1998	Release water to Eisemann Pond Keep pond dry through summer refill fall of 1999.	On Schedule.
Hampton #3 Pond	Late October 1998	Release water to Potter Creek. Keep pond dry through summer, refill fall of 1999	On Schedule.
W. Fish Hatchery	October 1998	Release water to E. Fish Hatchery. Keep pond dry through summer, refill fall of 1999.	On Schedule.
Eagle Pond	Late October 1999	Release water into Rat Ditch. Keep pond dry through summer, refill fall of 2000.	On Schedule.
Elk Pond	October 1999	Release water to '76 and Reservoir #2. Keep pond dry through summer, refill fall of 2000.	On Schedule.
Reservoir #1	Tentatively October 2000 If MMS funding for dike rehab can be obtained.	Release water to Goose Pond. Keep pond dry through summer and fall, refill spring of 2001.	On Schedule.
S. School Section Pond	October 2000	Release water to N. School Section. Keep pond dry through summer refill fall of 2001.	On Schedule.
Brocker Pond	October 2000	Release water to meadow. Keep pond dry through summer, refill fall of 2001.	On Schedule.
Birdie Pond	Late October 2001	Release water to Rat Ditch. Keep pond dry through summer, refill fall of 2002.	On Schedule.
Reservoir #2	October 2001	Release water to Annex Pond. Keep pond dry through summer, refill fall of 2002.	On Schedule.

Schedule is subject to change if dike work is needed on a specific pond.

# ANNUAL WATER MANAGEMENT PLAN 1997-1998

Mortenson Lake National Wildlife Refuge  
Administered by Arapaho National Wildlife Refuge

## I. Water Rights

Priority	Ditch	Date Use	Acre Feet	Acres	Source
Permit #5617	Soda Lake Reservoir	1947 Storage Irrigation	153 AF	--	Pioneer Ditch Natural Springs Runoff
Permit #20459	Soda Ditch	1947 Supplemental	--	188	Pioneer Ditch Natural Springs Runoff
Permit #5631	Harman Reservoir	1947 Storage	87 AF	--	Pioneer Ditch Natural Springs Runoff
Permit #20133 #20132	Harman Ditch	1947 Irrigation 1947 Irrigation	— 1.10cfs	--	Pioneer Ditch Natural Springs Runoff
Permit #4454	Johnson #1 Stock Res.	1962 Storage	1.37 AF	--	Pioneer Ditch Runoff
Permit #4455	Johnson #2 Stock Res.	1962 Storage	1.72 AF	--	Pioneer Ditch Runoff
Permit #7259	Mortenson Lake	1967 Storage	247 AF	--	Pioneer Ditch Natural Springs Runoff

## II. 1997 Water Usage

The only water the Refuge received was supplemental runoff water in the South Canal from adjacent landowner Swanson. The South Canal flowed May 10<sup>th</sup> through August 15<sup>th</sup>, with 291 acre feet of water received. This water was used for meadow irrigation and eventually flowed into Gibbs Lake.

No work was accomplished on water management facilities this year.

III. Capacity of Refuge Lakes

LAKE	MAXIMUM SURFACE ACRES	MAXIMUM ACRE FEET	ACTUAL SURFACE ACRES (EST.) 4/97	ACTUAL SURFACE ACRES (EST.) 12/97
Mortenson	65	247	65	62
Little Mortenson	--	--	--	--
Soda	46	152	46	46
Gibbs	--	--	--	--
Harman	--	--	--	--
TOTAL	111	399	111	108

IV. 1998 Proposed Water Use and Management Needs

Any excess water in the South Canal will be diverted for irrigation purposes as in previous years.

If time and funds permit the following work will be done: Replace water control structure in Soda Lake dike and rehab the dike; replace old nonfunctional water control structure between Meebor and Soda Lakes.

# ANNUAL WATER MANAGEMENT PLAN 1997-1998

Hutton Lake National Wildlife Refuge

Administered by Arapaho National Wildlife Refuge

## I. Water Rights

Priority	Ditch	Date Use	CFS	Acres	Source
1	Red	1872 Irrigation	.15	10	Sand Creek
9	Richards	1888 Irrigation	.60	42	Sand Creek
12 ½	Hutton Lake Reservoir	1892 Irrigation	2,500 AF	--	Sand Creek
Permit #5212-E	1 <sup>st</sup> Enlargement Hutton Lake Ditch	1939 Irrigation Bird Refuge	1.6	112	Sand Creek
Permit #2304-E	Enlargement Kings Ditch	1909 Irrigation	Portion of 8.27	Portion of 579	Laramie River

## II. 1997 Water Usage

Sand Creek was open in the beginning of January and remained that way until late March. The headgate was opened in May with flows continuing until the end of the year. Approximately 1,737 acre feet were diverted, over three times as much as last year. A major effort was made to maintain Lake George water levels for the endangered Wyoming toad. Overflow from Lake George flows into Creighton Lake. Excess water from Rush Lake was diverted to Hoge Lake and overflow water from there flows into Hutton Lake.

No water facility management work was completed this year.

### III. Capacity of Refuge Lakes

Lakes	Maximum Surface Acres	Maximum Acre Feet	Actual Surface Acres (Est.) 4/97	Actual Surface Acres (Est.) 12/97
Hutton	221(Variable)	1135	150	180
Hoge	75	200	75	75
Rush	95	250	95	95
George	16	62	16	16
Creighton	210	2525	150	170
	617	4172	490	548

### IV. 1998 Proposed Water Use and Management Needs

Divert whatever water is available during the winter months until early spring. Fill Rush Lake to near capacity, then divert water out of Rush Lake to Lake George to maintain Wyoming toad habitat and then to the other ponds if water is available.

If time and funds permit the following work will be done: Re-set the Parshall flume and widen the Sand Creek ditch between the headgate and flume.

**1998 WATER MANAGEMENT PLAN  
1997 USE REPORT  
SHORT FORM**

Station Name:  
Bamforth NWR, WY

Date of Inspection:  
June 21, 1989

Water Right No:  
1887-Territorial

Source(s):  
Little Laramie River

Water Diverted:  
Yes

Means of Diversion:  
Rate

Impoundments:  
Yes

Water Level: 2 AF  
(Elev. or Est. Storage)

Wells:  
Free Flowing - N/A  
Pumped - N/A

Type of Use:  
Surface Irrigation Crop  
Fish & Wildlife  
Stock

**Overall Climatic Conditions:**

Water conditions were excellent in 1997, the Park Ditch was open 30 days with approximately 5 cfs flow. A total of 300 acre feet was diverted.

**Conditions of Facilities:**

The Park Ditch is in fair to poor condition and in need of some rehabilitation. The cost/benefit ratio of such rehab is questionable.

**Proposed Water Program:**

1998 - Continue to irrigate meadows when adequate water is available in the Park Ditch. Mr. Leonard Johnson, refuge neighbor and grazing permittee on the refuge, conducts all irrigation activities as a condition of his permit. (Leonard's son Mark Johnson completes most of the field work as Leonard is basically retired)

**Comments:**

The Park Ditch contains 18.42 cfs of high water right that is not honored except in excellent run-off years because of the large amount of water appropriations senior to its 1887 and 1900 applications. The principal Little Laramie River water user is the Wheatland Irrigation District. The Park ditch receives water only before the District "calls" for its water and only in proper adjudicated order. The Park Ditch headgate is the first one to be closed by the Water Commissioner when the Wheatland Irrigation District calls for water. Our water right for 1.71 cfs in the Park Ditch is therefore a poor water right.